

OK	1/25/85
WR	1/25/85
mk	1/25/85

FR/EN
WR MT

MEMORANDUM

To: AWR, Schranck, Region 6
From: Regional Hydrologist, Region 6
Subject: Annual Water Use Report/Management Plan
Medicine Lake WMD

Please remind the Refuge Manager that the report submitted for Medicine Lake NWR, although approved, did not include a section for the WPA's that hold water rights.

Reports are still required for Carlson WPA and Johnson Lake WPA, for which the Short Form will probably suffice.

If there are any questions, please contact Ginger Chesy at extension 6-6395.

Robert E. Schranck

bcc: Circ rf (2)
RD rf

EN:MFChesy:mk:1/25/85

Initial	Date
<i>ge</i>	<i>1/3/85</i>
<i>har</i>	<i>1-3-85</i>
<i>mk</i>	<i>1/3/85</i>

FR/EN
WR MT

JAN 3 1985

MEMORANDUM

To: AWR, Schrank, Region 6
From: ~~ACTING~~ Regional Hydrologist, Region 6
Subject: Annual Water Use Report/Management Plans

The following reports have been reviewed and found to be in order:

C.M. Russell NWR
UL Bend NWR
Medicine Lake NWR

Hallstone NWR
Halfbreed NWR
Lake Mason NWR
War Horse NWR
Wild Horse NWR
Yellow Water NWR
Miller Lake NWR

Please extend our thanks to refuge personnel for the effort expended in the preparation of this detailed documentation of refuge water use and the timely manner in which these reports were submitted.

However, one question arises regarding Table IV of the Medicine Lake report which fails to list Sayer Bay levels. Since Sayer Bay was included in the other tables, perhaps this was just an oversight. Please check and advise why it was omitted and if it will be included in future plans.

If there are any questions, please contact Ginger Chesy at extension 6-5395.

Ginger Chesy

bcc: RD rf
Circ rf (2)

EN:MChesy:mk:1/3/85

MEDICINE LAKE NATIONAL WILDLIFE REFUGE

MEDICINE LAKE, MONTANA

ANNUAL WATER MANAGEMENT PLAN

1984 Water Use Data
1985 Recommendations

UNITED STATES DEPARTMENT OF INTERIOR

FISH AND WILDLIFE SERVICE

MEDICINE LAKE NATIONAL WILDLIFE REFUGE

MEDICINE LAKE, MONTANA

ANNUAL WATER MANAGEMENT PLAN - 1985

I. RECORD OF 1984 WATER USE

A. Source of Supply

The winter of 1983-84 was the third consecutive year of extremely mild winter weather. Winter snowpack was almost non-existent. From December, 1983 through February, 1984, the greatest accumulation of snow was 4.5 inches with .99 inches of actual precipitation. Only 8.01 inches of precipitation was received for the entire year, which is only 56% of the normal 14.18 inches.

Spring run-off started in early February and ran through mid-April. Lost Creek, Sheep Creek, and Lake Creek provided no run-off in 1984. All other drainages provided only limited run-off.

Only Medicine Lake, #11 Lake, #10 Lake, and Sayer Bay were brought up to operational levels. All other impoundments started the summer with below normal levels. By late fall, all impoundments were far below normal. Katy's Lake and #12 Lake were at a 20 year low by late fall.

Refuge wetlands had a water deficiency of 19,079 acre feet prior to run-off. The refuge recorded only 12,815 acre feet of run-off diverted during the year from all tributary streams.

B. Type of Rights

Under the Montana Water Rights Adjudication Law, all water rights filed prior to 1973 had to be refiled before April 15, 1982. The refuge water rights were researched and filed by the Regional Office engineering water resources section. A filing of 30 different water rights totaling 146,715 acre feet of water was made prior to the deadline.

The legal process now requires water courts to review all claims in Montana, and issue preliminary decrees. Claimants will then have the opportunity for objections and appeals before final water decrees are issued. This very lengthy process could drag on for many years before the refuge receives the final decrees.

C. Quantity Used

A total of 12,815 acre feet of water was diverted from all tributaries. With the deficit figure of 19,079 acre feet prior to run-off, all available water was diverted and utilized.

In order to provide waterfowl production habitat in Homestead Lake, water was released from the Medicine Lake outlet structure No. 4 between March 26 and April 9. This resulted in about 1200 acre feet of water being diverted from Medicine Lake to bring Homestead Lake up one foot to an elevation of 1935.8 feet MSL.

The only other water release was about 340 acre feet of water released on August 2 from Sayer Bay, and held in Medicine Lake. This 2 foot draw down was necessary to lessen botulism losses in Sayer Bay.

TABLE I. MAJOR IMPOUNDMENT WATER DEFICIT

January 1, 1985

Impoundment	Elevation Jan. 1, 1985	Operating Elevation	Elevation Difference	Acre Feet Deficit	Surface Acres at Operational Level
Homestead Lake	1931.5 **	1937.65	-6.15	7,552	1,228.0
Gaffney Lake	1941.9 **	1945.0	-3.1	1,998	644.4
#10 Lake	1944.1	1945.8	-1.7	452	266.0
Deep Lake	1942 **	1945.8	-3.8	378	99.6
Long Lake	1941.9 **	1945.0	-3.1	215	69.2
#11 Lake	1950.68	1953.0	-2.32	444	191.2
#12 Lake	1952.2	1956.0	-3.8	1,821	479.2
Katy's Lake	1951 **	1954.4	-3.4	1,061	312.0
Medicine Lake	1941.0	1943.02	-2.02	16,957	8,394.8
Sayer Bay	1941.5 **	1945.0 *	-3.5	595	170.0
TOTAL				31,473	11,854.4

* Suggested level for 1985

** Estimated only - water level below gauge

TABLE II. COMPARISON OF WATER DEFICIENCIES*
(In Acre Feet)

Impoundment	1985	1984	1983	1982	1981
Homestead Lake	7,552	4,973	3,352	5,993	4,298
Gaffney's Lake	1,998	709	516	3,022	2,442
#10 Lake	452	319	106	356	266
Deep Lake	378	249	159	287	403
Long Lake	215	76	55	377	291
#11 Lake	444	382	153	402	405
#12 Lake	1,821	1,006	455	1,198	729
Katy's Lake	1,061	749	281	705	661
Medicine Lake	16,957	10,242	10,242	29,969	23,002
Sayer Bay	595	374			
TOTAL	31,473	19,080	15,319	42,309	32,497

* Deficiencies based on water elevation on January 1 of each year.

D. Adequacy of Supply

Spring run-off was not sufficient to fill all refuge impoundments this year. Only Medicine Lake, #10 Lake, #11 Lake, and Sayer Bay reached operational levels. Lack of available water prevented adequate flushing action in refuge impoundments. This resulted in increased salinity levels in all impoundments.

TABLE III. WATER RECEIVED PER TRIBUTARY STREAM - 1984

<u>Tributary Source</u>	<u>Acre Feet of Water Diverted</u>
Muddy Creek	12,016
Lost Creek	0
Sheep Creek	0
Sand Creek	331
Cottonwood Creek	468
Lake Creek	0
<hr/>	
TOTAL	12,815 Acre Feet

E. Improvements to Water Facilities During 1984

The Sayer Bay dam and water control structure was completed in the fall of 1983. Force account rip-rapping of the spillway, control structure, and dike was completed in February of 1984. A water gauge was installed in September. This impoundment was filled by spring run-off, and created one of the most attractive marshes for waterfowl on the refuge.

F. Effects of the Previous Years Objectives

All available spring run-off was diverted to refuge impoundments. Sheep Creek, Lost Creek, and Lake Creek did not provide any run-off during 1984, and impoundments dependent on these flows suffered. Katy's Lake and #12 Lake received no run-off and are presently at the lowest level observed in over 20 years. Sheep Creek Dam and Breaser Dam also received no run-off. They were extremely low during the spring nesting period, and became totally dry by late summer.

All available spring run-off was, when possible, diverted to the highest priority waterfowl impoundments first.

With reduced spring run-off, only limited flushing of #11 Lake, #10 Lake, and Sayer Bay was accomplished. With reduced water levels in all impoundments, salinity levels increased significantly when compared to 1983. This resulted from higher concentrations of dissolved minerals as water levels were reduced by evaporation. Wetlands with the highest increase in salinity from 1983 were Katy's Lake, 3.7 to 10.5 parts/1000; Homestead Lake, 1.5 to 3.0; and Deep Lake, 2.5 to 3.25.

would be nice to have this in terms of conductivity, too.

TABLE IV. MONTHLY RECORD OF GAUGE READINGS - 1984

IMPOUNDMENT Operational Level	Homestead Lake	Gaffney Lake	#10 Lake	Deep Lake	Long Lake	#11 Lake	#12 Lake	Katy's Lake	Medicine Lake
January	1933.6	1943.9	1944.6	1943.3	1943.9	1951.0	1953.9	1952.0	1941.8
February			1945.5			1952.5			
March	1935.0		1946.25	1944.0				1952.4	1942.9
April	1935.8	1944.15	1955.95	1945.0	1944.15		1954.2	1952.4	1943.2
May	1935.2	1943.8	1955.75	1944.7	1943.8		1953.9		1942.7
June	1935.1	1943.9	1955.74	1943.9	1943.58		1953.75	1952.0	1942.5
July	1934.66	1943.06	1955.38	1943.9	1943.06		1953.45	1951.7	1942.2
August	1934.1	1942.5	1954.7		1942.5		1952.78	1951.4*	1941.78
September	1932 *		1944.1		1941.9 *	1950.58	1952.0 *	1951.2*	1941.2
October	1931.6 *	1941.9 *	1944.1 *	1942 *	1941.9 *	1950.68	1952.2	1951.0*	1941.0
November	1931.6 *	1941.9 *	1944.1 *	1942 *	1941.9 *	1950.6	1952.2	1951.0*	1941.0
December	1931.6 *	1941.9 *	1944.1 *	1942 *	1941.9 *	1950.6	1952.2	1951.0*	1941.0

* Estimated only - water level too low to read on gauge.

See page 5

All available run-off from the Big Muddy Creek was diverted into Medicine Lake. By early April, the lake had reached the operational level 1943.02 feet MSL. The maximum level attained was 1943.20 feet in mid-April. These levels provided good waterfowl pair habitat along the shoreline. This level also maintained water in the emergent vegetation stands west of Highway 16, and provided secure nesting locations for the western grebe colonies. Water levels were adequate to provide good spawning, hatching, and fry development habitat for northern pike.

Due to inadequate flows entering Homestead Lake, about 1200 acre feet of water was released from Medicine Lake between March 26 and April 9. This diverted water brought Homestead Lake up one foot to 1935.8 feet MSL. This level provided adequate waterfowl pair and brooding habitat. Constructed nesting islands had enough water surrounding to provide secure nesting locations. The emergent vegetation was not sufficiently flooded to provide ideal nesting locations for most waterbirds such as grebes and night herons.

Evaporation reduced the water levels in Homestead Lake in excess of what was recommended for botulism prevention. Water levels receded to 1934.1 feet MSL by early August which removed all water from the emergent vegetation. No waterfowl losses to botulism occurred at Homestead Lake in 1984.

Due to reduced water levels in Medicine Lake by early fall, no water was released to Homestead Lake for fall migrational habitat. Water levels receded to about 1931.6 feet in Homestead Lake by October. This resulted in vast mud flats and poor migrational habitat. Homestead Lake had very little waterfowl use during the fall.

With reduced spring run-off, the only impoundments in the Lake Creek drainage brought up to operational levels were #10 Lake, #11 Lake, and Sayer Bay. These three wetlands provided excellent pair and brooding habitat. The other impoundments including Gaffney Lake, #12 Lake, Long Lake, Katy's Lake, and Deep Lake had reduced water levels in early spring which reduced their attractiveness for pairing and brooding habitat.

The new Sayer Bay impoundment was filled to about 1944.0 feet MSL, as recommended. This resulted in one of the most attractive waterfowl marshes on the refuge. The two breeding pair transects in Sayer Bay showed a tremendous increase in waterfowl pair utilization from 54 pairs in 1983 to 191 pairs in 1984. Large numbers of broods were also observed in this impoundment.

Although water levels in Sayer Bay and #10 Lake were maintained as constant as possible through the early summer, as recommended to reduce botulism severity, losses to this disease still occurred. A total of 472 dead ducks were collected from Sayer Bay, and 62 ducks from #10 Lake. On August 2, 1984, Sayer Bay

Why not listed w/ other impoundments?

was drawn down about 2 feet by pulling all the stop logs. This draw down dispersed the birds, and reduced future losses to botulisms in this impoundment.

1984 SUMMARY

Water deficiency January 1, 1984	19,079 A/F
Total water diverted through to refuge 1984	12,815 A/F
Excess water released into Muddy Creek 1984	0 A/F
Water Released from Homestead Lake (Summer Drawdown)	0 A/F
Water diverted from Medicine Lake to Homestead Lake (Spring pair and brood habitat 3/26 - 4/9/84)	1,200 A/F
Water released from Homestead Lake (Winter Drawdown)	0 A/F
Water deficiency on December 31, 1984	31,473 A/F

II. RECOMMENDATIONS AND OBJECTIVES FOR WATER MANAGEMENT IN 1985

A. General Recommendations for all Impoundments on the Refuge are as Follows:

1. Fill all refuge impoundments as early as possible to insure retaining all available flow from the spring run-off.
2. Fill all upper impoundments with waters from Lake Creek, Sand Creek, and Cottonwood Creek before allowing these waters to enter Medicine Lake.
3. Provide for as much flushing action as possible with available spring and summer run-off. This will improve water qualities by reducing salinity.
4. Continue to collect water quality information by taking salinity and conductivity readings for all major water flows entering or being discharged from the refuge. Spring and late fall readings should be collected, as in the past, for all major impoundments. The collection of this data will document any changes in water quality occurring over the years.

Table V shows the priority of water use on the refuge. Priority I impoundments should be filled and maintained before priority II impoundments.

TABLE V. PROPOSED WATER USE PRIORITY

<u>Unit</u>	<u>Purpose</u>	<u>Priority</u>
#12 Lake	Nesting, brooding, storage, fish rearing	1
Katy's Lake	Nesting, brooding, storage	1
#11 Lake	Nesting, brooding, storage	1
#10 Lake	Nesting, brooding, storage	1
Gaffney Lake	Nesting, brooding, storage, fish rearing	2
Deep Lake	Nesting, brooding, storage	1
Long Lake	Nesting, brooding, storage	2
Sayer Bay	Nesting, brooding, storage, fish rearing	1
Medicine Lake	Nesting, brooding, storage, fish rearing	2
Homestead Lake	Nesting, brooding, storage	1
Sheep Creek	Nesting, brooding	1
Breaser Dam	Nesting, Brooding	1

B. Specific Recommendations and Objectives for Individual Impoundments for 1985

1. Medicine Lake: The mid-winter water elevation is two feet below the operational level of 1943.02. This will require about 16,957 acre feet of water to meet management objectives. It is recommended to divert all available spring run-off from the Muddy Creek into Medicine Lake. If run-off exceeds this 16,957 acre feet, it is recommended to allow the maximum level to reach an elevation of 1944.0. At this level, water will spill over the #4 spillway until slowly receding to the 1943.02 level. If levels exceed the 1944.0 level, the #4 structure should be opened to relieve pressure on the spillway.

If flows entering Homestead Lake are not sufficient to fill the lake, water from Medicine Lake shall be released to provide what is required at Homestead.

Heavy silt laden waters of Big Muddy Creek, following heavy summer thunderstorms, will be kept from entering Medicine Lake using the new #1 structure on the diversion canal. This will alleviate sediment deposits on the west end of Medicine Lake. Medicine Lake water levels should be high enough this year that the need for this silt laden waters should not be required.

By allowing Medicine Lake to reach an elevation of 1944.00 feet in the early spring, and allowing it to recede to 1943.02 by early summer, the following objectives should be met.

- a. Waterfowl breeding pair habitat will be adequate. Water levels in emergent vegetation will provide nesting locations for over the water nesters including waterfowl, grebes, and black-crowned night herons.

- b. Natural islands will be secure and provide nesting sites for geese, pelicans, cormorants, and great blue herons.
 - c. After normal water loss, due to evaporation and seepage, early fall water levels will be adequate to provide a water release to Homestead Lake for migrational habitat on Medicine Lake as well as adequate water depth for over-wintering fish.
 - d. This elevation will provide excellent early spring northern pike spawning habitat in the emergent vegetation stands west of Highway #16.
 - e. Erosion of islands and shorelines by wave action will not be excessive. This level has been commonly reached in past years without causing excessive damage.
2. Homestead Lake: This impoundment is about 6 feet below operational level of 1937.65 feet MSL. This will require about 7,552 acre feet of water to meet management objectives. It is recommended to divert all available flows of Sheep Creek, Lost Creek, and the Big Muddy Creek into this impoundment. If adequate flows are available, flushing should be accomplished by diverting and then releasing water through the #6 structure. If flows are inadequate to reach the operational level, water should then be released from Medicine Lake to meet this need.

Specific Objectives to be met in 1985

- a. Water fowl breeding pair habitat will be at optimum at spring operational level.
- b. Over water nesting sites in emergent vegetation for waterfowl, grebes, and black-crowned night herons will be optimum at spring operational levels.
- c. Constructed nesting islands will provide secure nesting sites for geese and other waterfowl at spring operational levels.
- d. Aquatic vegetation should flourish at spring operational levels in this relatively shallow impoundment.
- e. Experimental fish screens should be constructed for the three inlet risers. These screens will reduce adult carp from entering this impoundment from the Muddy Creek. Reduction of carp should improve aquatic vegetation in this impoundment.
- f. To reduce the hazard and severity of avian botulism, the lake level will be drawn down beginning in late June. Volume of water release must be controlled to prevent flooding the access crossing to BIA hay fields

downstream. The water level will be at 1936.00 elevation by July 1, and further reduced to an elevation of 1934.30 by August 1. At this level, water will be removed from the emergent shoreline vegetation stands, which seem to contribute to the severe botulism outbreaks.

- g. If water levels permit, a release of water from Medicine Lake, in mid-September, can be diverted into Homestead Lake to bring levels back up to 1935.50 elevation to provide adequate fall migrational habitat for waterfowl. This will require about 2,000 acre feet of water from Medicine Lake.
 - h. Water will again be released after fall migration is completed. By releasing water, about November 1, and reducing the lake level to 1934.0 elevation, the carp population of the lake should be adequately reduced.
3. Lakes #10, #11, #12, Gaffney Lake, and Long Lake: Water levels for this series of water units are all dependent on spring run-off flows from Cottonwood, Sand, and Lake Creeks. Mid-winter water levels vary from 1.7 to 3.8 feet below operational levels. Upstream impoundments will be filled first, then each impoundment below. If flows are adequate, water control structures will be opened rather than relying on spillways. This provides the best flushing action, and allows for the reduction of accumulated salinity in these units.

Specific objectives to be met in 1985

- a. If spring run-off is adequate, all impoundments will be filled to operational levels as early as possible.
 - b. If water reaches operational levels, breeding pair habitat for waterfowl will be maximized.
 - c. At operational levels, constructed and natural nesting islands will remain secure, and yet minimize erosion by wind and wave action.
 - d. No water releases or drawdowns will be accomplished. By maintaining water levels as close to operational level as possible, brooding habitat will be optimum. After evaporation and loss to seepage, levels will remain adequate for fall migration.
 - e. An experimental fish screen will be constructed by refuge personnel, and placed in the #10 Lake outlet to Gaffney Lake in an attempt to reduce adult carp in #10 Lake. If successful, submergent vegetation should be improved.
- f. Lakes #10 and Gaffney have been historic sites for

avian botulism. This outbreak can be minimized or the severity reduced by maintaining constant water levels. Rapid flooding of shallow areas following heavy summer rain storms seems to trigger outbreaks in these impoundments. Levels must remain constant following storms.

4. Katy's Lake and Deep Lake: These two natural sumps do not have outlets providing the option of flushing. These water bodies are the most alkaline marshes on the refuge. Both marshes have water supplies provided by canals from water control structures.

Specific objectives to be met in 1985

- a. A cooperative construction project, with Ducks Unlimited proposes to construct a two acre nesting island within Katy's Lake. If this project is not completed in the winter of 1984-85, and if Ducks Unlimited can give assurance of completion in the winter of 1985-86, additional water should not be diverted to Katy's Lake for one more year. In order for construction to be successful, the winter water level of Katy's Lake should not exceed 1951.0. At this level, 3 feet of water remains, which will likely freeze to the bottom to allow construction to be completed. There is no alternative for removal of water in this wetland.
 - b. Deep Lake should be filled to operational levels. This will maximize breeding pair and brood habitat.
 - c. Katy's Lake has a history of botulism. Rapid rises in mid-summer water levels must be prevented to alleviate losses.
5. Sayer Bay: This impoundment will be in it's second year of operation since the completion of the new Sayer Bay Dam. This wetland demonstrated it's potential as a waterfowl production marsh in 1984. However, several problems became evident last year. Avian botulism will apparently be a yearly concern. Emergent vegetation will likely spread in the upper end of this wetland, and could develop into solid stands reducing attractiveness to waterfowl. Sayer Bay may be very attractive to spawning fish, both game fish and carp, but may become a death trap due to winter kill.
 - a. This is a relatively new dam with a rock gabion basket spillway elevation of 1946.0 feet MSL. Providing there is not a high spring run-off, which would require use of the spillway, it is recommended to increase the level of this impoundment by one foot over the level reached in 1984. This level of 1945.0 may reduce the spread of emergent vegetation, and may reduce the avian

botulism by reducing the amount of very shallow marsh.

- b. The stop log structure will have the appropriate boards in place prior to spring run-off in order to maintain the 1945.0 water elevation. This is required to eliminate all fish entry into this impoundment. This barrier will eliminate carp, and should improve water quality and submergent vegetation. Preventing northern pike from entering this impoundment will reduce the chance of losing these fish to winter kill next winter.
- c. This impoundment will be closely monitored for avian botulism. With the large number of waterfowl and broods utilizing this area, the potential for significant botulism loss begins to occur, it is recommended to pull all the stop logs, and quickly draw this impoundment down to about the 1942 elevation. At this water elevation, all of the water is removed from the shallow water areas. This same method was effective in 1984 for reducing losses. It is recommended to prevent rapid rises in water levels following heavy summer thunderstorms. Rapid flooding of shallow vegetated flats could trigger an avian botulism outbreak.

TABLE IV. MONTHLY RECORD OF GAUGE READINGS - 1984

IMPOUNDMENT Operational Level	Homestead Lake	Gaffney Lake	#10 Lake	Deep Lake	Long Lake	#11 Lake	#12 Lake	Katy's Lake	Medicine Lake
January	1933.6	1943.9	1944.6	1943.3	1943.9	1951.0	1953.9	1952.0	1941.8
February			1945.5			1952.5			
March	1935.0		1946.25	1944.0				1952.4	1942.9
April	1935.8	1944.15	1945.95	1945.0	1944.15		1954.2	1952.4	1943.2
May	1935.2	1943.8	1945.75	1944.7	1943.8		1953.9		1942.7
June	1935.1	1943.9	1945.74	1943.9	1943.58		1953.75	1952.0	1942.5
July	1934.66	1943.06	1945.38	1943.9	1943.06		1953.45	1951.7	1942.2
August	1934.1	1942.5	1944.7		1942.5		1952.78	1951.4*	1941.78
September	1932 *		1944.1		1941.9 *	1950.58	1952.0 *	1951.2*	1941.2
October	1931.6 *	1941.9 *	1944.1 *	1942 *	1941.9 *	1950.68	1952.2	1951.0*	1941.0
November	1931.6 *	1941.9 *	1944.1 *	1942 *	1941.9 *	1950.6	1952.2	1951.0*	1941.0
December	1931.6 *	1941.9 *	1944.1 *	1942 *	1941.9 *	1950.6	1952.2	1951.0*	1941.0

* Estimated only - water level too low to read on gauge.